

# Science Education in the 21st Century

## Welcome to the Science DLE

Wayne Grant

Chief Education Officer  
PASCO scientific

Rhonda Rosales

K-8 Product Manager  
PASCO scientific

How has a child's world changed in the last 150 years?

How has a child's world changed in the last 150 years?

It's hard to imagine any way in which it hasn't changed.

and yet...

...if you look at school today versus 100 years ago, they are more similar than dissimilar.

-Peter Senge Massachusetts  
Institute of Technology

In 1985 approximately 130,000 degrees in science and engineering were earned in the U.S.

In 1985 approximately 130,000 degrees in science and engineering were earned in the U.S.

In 2005 that increased to almost 175,000.

But how many of these were awarded to non-residents?

46% of the degrees were awarded to J-1 Visa holders planning to return to their home countries.

In 1985 approximately 30,000 degrees in science and engineering were earned in China.

In 1985 approximately 30,000 degrees in science and engineering were earned in China.

In 2005 that increased over a factor of five to almost 175,000.

Anyone... who says that the Chinese or Indians are not entrepreneurial, not creative, that they don't want to rival the United States in business start-ups...

Anyone... who says that the Chinese or Indians are not entrepreneurial, not creative, that they don't want to rival the United States in business start-ups...

...has not been to India or China.

- Craig Barrett  
Intel CEO

By 2010, more than 90% of all scientists and engineers will be living in Asia.

What English-speaking North American country using the dollar as its currency ranked 2<sup>nd</sup> on the combined PISA science literacy scale?

What English-speaking North American country using the dollar as its currency ranked 2<sup>nd</sup> on the combined PISA science literacy scale?



What percentage of college students elect STEM-related majors?

What percentage of college students elect STEM-related majors?

Only 7%

Of that 7%, what percentage stay in the major after their freshman year?

Only 3%

Which president announced:

Which president announced:

“the public education system is in need of a complete overhaul if the US wants to produce enough scientists and engineers to keep up globally?”

Dwight D. Eisenhower, 1954

And other countries have shown improvement in their rates.

Far too many fifteen-year-old students in the U.S. ...are unprepared for the global economy.

2006 PISA report

Far too many fifteen-year-old students in the U.S. ...are unprepared for the global economy.

2006 PISA report

The U.S. has fallen below average while other countries are moving higher.

According to the TIMMS report: 7 of 16 countries showed improvement in average science scores over the 1995 to 2007 time period.

According to the TIMMS report: 7 of 16 countries showed improvement in average science scores over the 1995 to 2007 time period.

How did the U.S. fare?

TIMSS results showed no detectable change in science achievement for U.S. students.

How does the U.S. rank among 30 OECD countries for 55 to 65-year-olds with high school diplomas?

- a) First
- b) Second
- c) Third
- d) Fourth
- e) None of the above

How does the U.S. rank among 30 OECD countries for 55 to 65-year-olds with high school diplomas?

- a) First
- b) Second
- c) Third
- d) Fourth
- e) None of the above

Answer: a) First!

How does the U.S. rank among 30 OECD countries for 25 to 34-year-olds with high school diplomas?

- a) First
- b) Second
- c) Third
- d) Fourth
- e) None of the above

How does the U.S. rank among 30 OECD countries for 25 to 34-year-olds with high school diplomas?

- a) First
- b) Second
- c) Third
- d) Fourth
- e) None of the above

Answer: e) None of the above. The U.S. ranks 11th.

U.S. students scored lower than average on two of the three content area subscales:

U.S. students scored lower than average on two of the three content area subscales:

- explaining phenomena scientifically;
- using scientific evidence.

It is possible to miss half of the questions on some state achievement tests and still be judged proficient in that subject.

Today's education system faces irrelevance unless we bridge the gap between how students live and how they learn.

Partnership for 21<sup>st</sup> Century Skills

Today's education system faces irrelevance unless we bridge the gap between how students live and how they learn.

Partnership for 21<sup>st</sup> Century Skills

Less than 40% of students see learning science as important for making informed decisions in the future.

93% of students in grades 5-9 were taught physical science by a teacher lacking a major or certification in the physical sciences.

Teachers teaching out-of-subject tend to rely heavily on textbooks and avoid open-ended explorations.

Students are most motivated to learn science when they *do* authentic science rather than focus on the knowledge science has already produced.

Inquiry-based approaches focus on problem-solving, collaboration, critical thinking and research.

Inquiry-based approaches focus on problem-solving, collaboration, critical thinking and research.

They are essential for science literacy.

But only one in four teachers say they are using these methods.

And 29% of K-5 teachers report teaching science only two or fewer days per week.

Lab experiences provide opportunities for:

Lab experiences provide opportunities for:

students to interact directly with the material world...

...using tools, data collection techniques, models, and theories of science.

57% of K-12 administrators gave a passing grade to their school for preparing students for jobs of the future.

57% of K-12 administrators gave a passing grade to their school for preparing students for jobs of the future.

Only 47% of teachers agree

Only 43% of parents agree

Only 23% of students agree

Competitiveness is very much on the agenda. The problem is to convert that interest into action.

Norman Augustine  
Rising Above the Gathering Storm

Competitiveness is very much on the agenda. The problem is to convert that interest into action.

Norman Augustine  
Rising Above the Gathering Storm

The number of U.S. college grads in physics in 1956, the year before Sputnik, was twice the number of graduates in 2004.

Based on 2014 workforce projections...

...15 of the 20 fastest growing occupations require significant science or math training.

Based on 2014 workforce projections...

...15 of the 20 fastest growing occupations require significant science or math training.

86% of jobs in high-growth industries will require college level work in STEM fields.

Yet more students are choosing not to major in these areas.

Scientists and engineers educated in the 1950s and 1960s are retiring or will be retiring over the next decade.

Scientists and engineers educated in the 1950s and 1960s are retiring or will be retiring over the next decade.

Who will take their place?

Who will work to solve problems caused  
by climate change?

Who will work to solve problems caused by climate change?

Who will identify a way to break the U.S. dependency on foreign oil?

Who will find a cure for cancer?

If students continue to pursue degrees and careers in fields other than STEM-related areas, the U.S. will find it difficult to compete in the global economy.

SETDA September 2008 report

If students continue to pursue degrees and careers in fields other than STEM-related areas, the U.S. will find it difficult to compete in the global economy.

SETDA September 2008 report

Unfortunately, the U.S. has made little progress.

*We have two choices:*

*We have two choices:*

1. learn to expect less and no longer be the leading economic power in the world.
2. efficiently articulate and implement a national innovation agenda, including education reform.

Which do you choose?

In a global economy, where the most valuable skill you can sell is your knowledge, a good education is no longer just a pathway to opportunity. It is a pre-requisite.

President Obama  
Feb 25, 2009

In a global economy, where the most valuable skill you can sell is your knowledge, a good education is no longer just a pathway to opportunity. It is a pre-requisite.

President Obama  
Feb 25, 2009

# Credits

- Wayne Grant (wgrant@pasco.com)
- Rhonda Rosales (rosales@pasco.com)
- Sandy Brooks (sbrooks@pasco.com)